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ATV How To Do It

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Whatever it is

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ATV How To Do It

Whatever it is

Vaudevillian, Eddie Foy, admiring the Brooklyn Bridge, the engineering marvel of the day, remarked; "Just think, all that trouble just to get to Brooklyn". To some, Advanced Television, or ATV, is in the same "too much trouble for what it is" category.

But, what is it over which we have taken so much time and trouble? Is it worth it, or is it just another technical marvel - Television's Brooklyn Bridge? Is ATV digital "standard" television, compressed multi-program television, high definition television, data - a sort of television without pictures, or is it some combination of all these?

"Advanced television", or ATV, is a generic term, not a specific one. At the time the FCC Advisory Committee was formed in 1987, television was analog, and it was not believed technically possible to transmit true HDTV within a 6 MHz terrestrial television channel. Only some enhancement of NTSC was expected. Thus, instead of HDTV, the title of the FCC Advisory Committee used the words "Advanced Television" - words which had no specific meaning other than "something improved over NTSC".

As progress was made, however, true HDTV not only became a technical reality, but became an all-digital technical reality, able to deliver a wide screen HDTV signal to the American home in a normal 6 MHz television channel. Thus, ATV became HDTV!

In its First Report and Order, adopted August 24, 1990, the FCC recognized this technological breakthrough and decided:

"We have determined, based on the record compiled in this proceeding, that we will select a "simulcast" high definition television (HDTV) system, that is, a system that employs design principles independent of the existing NTSC technology, for ATV service."

The FCC further defined HDTV:

"The term HDTV indicates systems that use new technology and provide a major improvement in television service. The goals of such a system are to offer approximately twice the vertical and horizontal resolution of NTSC receivers, provide picture quality approaching that of 35mm film, and sound quality approaching that of a compact disc."

The evolution of the FCC's ATV proceeding clearly shows the Commission's intention to define "ATV" as "HDTV", thus making a major improvement in American television, and, to transition the Nation to an all-HDTV service.

The FCC, its Advisory Committee on Advanced Television Service, and the "Grand Alliance" did the impossible over the last seven years with the expenditure of tens of millions of private sector dollars. They made digital terrestrial HDTV a practical reality, and set the pace worldwide. The "Grand Alliance" system is under construction, its 8 VSB transmission system has been very successfully laboratory and field tested, the complete system will be in laboratory test by year end, and it is going to work, and work well. A full field test will confirm the laboratory tests, and a final recommendation will be submitted to the FCC for its consideration.

As to the just-released report on the HDTV digital terrestrial transmission tests carried out in Charlotte, North Carolina, the results are pertinent.

Comparative tests of standard NTSC and digital HDTV signal reception were made at 199 locations. For NTSC, satisfactory reception was considered to be CCIR Grade 3 ("slightly annoying"). For the digital HDTV, the threshold is well defined - a good picture, or none at all.

For the tests, the VHF, channel 6 NTSC peak visual ERP was 10 kw, while the HDTV digital transmitter average ERP was only 630 watts, or 12 db below the peak NTSC visual power. Under these conditions, 39.6 percent of the locations gave satisfactory NTSC reception, while 81.7 percent, or twice as many locations, gave satisfactory digital HDTV reception.

On channel 53, in the UHF band, the NTSC peak visual ERP was 500 kw, and the HDTV digital transmitter average ERP was 31.6 kw, also 12 db below the peak visual ERP. At channel 53, 76.3 percent of the locations gave satisfactory NTSC reception, compared with 91.5 percent for digital HDTV.

Analyzing the results as a function of distance from the UHF transmitter, up to 10 miles, digital HDTV provided 10 percent more locations with satisfactory reception than NTSC. In the range of 40 to 56 miles from the transmitter, digital HDTV provided 51 percent more locations with satisfactory reception than NTSC.

The impact of these results is clear. Digital transmission provides better coverage and thus more viewers. While the actual increase in audience will, of course, vary from market-to-market,

the pattern is evident, and this will ultimately lead to incremental revenue for a commercial television station.

Terrestrial HDTV will become a technical reality in 1995, and with its digital technology, and the employment of the MPEG-2 compression and transport protocols a host of audio/video formats and data can be transmitted in the 20 Mb/s HDTV digital channel. Thus, ATV could encompass a combination of high definition programs, multi-program "standard" definition television, and data services.

The analog constraints of NTSC are gone, and now, a multiplicity of things are possible. The questions are, what will be permitted by the FCC, what will be practical for television stations, what will broadcast audiences want, and what will be profitable for commercial broadcasters?

So, if that's what ATV is, how do we do it? My opinion follows.

From the regulatory viewpoint, one thing seems clear. The new all-digital television service must be a vast improvement over NTSC, on the scale of HDTV, since nothing less could justify the free and exclusive grant of 1600 new VHF and UHF television channels in prime spectrum space to the existing terrestrial broadcasters. After all, the VHF and UHF spectrum is assigned to broadcasting on a shared basis, and lacking a vast improvement in the service, requiring the use of a "simulcast" channel, the new channels might be licensed to "new" and different broadcasters.

The concern over the granting of these channels would not be so important were it not for the fact that these 1600 new TV channels are the last television channels available in the VHF and UHF spectrum. Thus, these channels represent the last chance the Nation has to improve future television delivered over-the-air to the American home.

From the broadcasters' viewpoint these new channels are the last chance terrestrial broadcasters have to transition to an all-digital service to be able to compete with the already existing all-digital DBS satellite service and the soon-to-be digital cable and fiber television services. Lacking a digital service, terrestrial broadcasting will become a secondary service.

Thus, whatever broadcasters do, they must make an improvement in the television service great enough to justify the grant of the 1600 simulcast channels. In short, don't lose the channels or run the risk of having to bid for them at an "all-comers" auction! The cost of the channels at an auction would make HDTV conversion costs seem insignificant!

Clearly, high definition is such a quantum leap in quality since it is an all-digital service with twice the resolution of NTSC, a wide screen 16:9 aspect ratio, a greatly improved color quality, and compact disc quality multichannel sound.

Additionally, the "Grand Alliance" HDTV system also supports the transmission of single channel NTSC upconverted to the HDTV signal format. This permits a smooth integration of present NTSC programs and program segments into the HDTV signal. In this manner, HDTV programs and NTSC programs can be intermixed on the simulcast channel and received by HDTV receivers tuned to the HDTV channels. This will be especially important in the early years when stations may not be able to broadcast a full HDTV schedule.

What about multiple program transmission on the simulcast channel? While the present state-of-the-art will only permit the transmission of a single HDTV program on the simulcast channel, the HDTV video compression techniques in the "Grand Alliance" system will permit the transmission of multiple "standard" quality, 525 line, NTSC-like programs on the single simulcast channel. The technical quality of each such program depends on the number of simultaneous programs being transmitted, the type of program, and the compression system employed, but with present technology it is probably feasible to transmit four to five NTSC quality programs simultaneously at data rates of 4 or 5 Mb/s each.

Will such a system represent a sufficient improvement in quality and/or service to the public to merit the assignment of a simulcast channel to each existing television station or not, and, if so, will multi-program broadcasting be practical?

The technical quality of the multiple "standard" TV programs will be essentially the same as today's NTSC programs, so, unless the multiple program transmissions are intermixed with a significant HDTV program schedule, its merit would have to be found solely in its multiplicity. "More-of-the-same" alone, without an HDTV schedule as well, might not be considered worthy of the assignment of the second simulcast channel.

As to the practicality of multiple program transmission, the initial, and largest, conversion cost to purchase and install the digital transmitter, antenna, transmission line, tower (or the modifications thereto), is the same for HDTV or for multiple program "standard" TV broadcasting. Depending on each station's situation, the initial start-up costs of satellite downlinks, terminal equipment, program origination facilities, etc. could be the same as that for HDTV, or even more, for the multiple program option.

Nevertheless, if the multiple program approach is taken, one program will be the station's present output, leaving three to four program services to be acquired and/or produced.

In choosing the program services, three options exist:

- the programs are to be advertiser-supported,
- the programs are to be supported by viewer subscription,
- the programs are to be un-supported.

Before examining these three options, the experience of the cable industry in the multiplication of channels offered bears consideration. In the next 12 months, 75 new cable networks are scheduled to be launched, generally serving niche markets from Gothic Romance, through knitting, to golf. Of these, it is likely that only one third will break even or survive.

Starting a new network rarely costs less than \$50 million, while those that commission original programs, may cost \$100 million or more.

It is difficult to recover these costs, because niche markets, by definition, have few viewers, and the big advertisers tend to ignore networks that reach less than 20 million viewers. Even the now successful MTV network took five years to break even, while the new "America's Talking" and ESPN-2 networks opened with 10 million and 15 million subscribers respectively.

The plethora of choices is no guarantee of success. Some niche markets, like CNN, succeed, but one is faced with the fact that people, faced with many options, reduce the number intellectually to between 7 and 9. They then select from among this small group. Television audience analysis shows that this group consists of the four commercial networks, perhaps a local independent station, and a couple of niche market cable networks. Thus, in the face of large capacity cable systems with a large installed base, the economic outlook for three or four new program streams from local broadcasters is not bright.

If advertiser support is planned for the additional channels, programs would have to be of sufficient audience appeal as to attract a large number of viewers, and most of this audience would likely come from the station's own main channel program. Moreover, such programs are expensive to produce, probably beyond the ability of most stations, or even groups of stations, to finance.

Advertising revenue in a local market is not a limitless resource, and indeed, to some degree, the additional new program channels and

those of other stations in the market will merely fractionate each station's existing advertising revenue.

For a lower program acquisition cost, off-network and syndicated programs can be considered. However, the advertising revenue to be expected from this category of programming will be lower and less likely to draw an audience from competitive broadcast programs. The acid fact remains that advertisers pay on the basis of anticipated and, later, of proven audience size.

Alternatively, It is possible to provide programming for specialized niche markets. The program acquisition costs are low, as also is the likely audience. The merit of this approach is that there will be very little audience drawn from the other programs being broadcast, and in fact a small, but additional audience may be gained. The advertising revenue will be generated from companies serving the niche market's interests, and although small, it will be incremental.

Finally, the additional program streams may be devoted to information services such as stock market prices, local information and services, sports data, and local news. Here again, acquisition costs are very low, and may be adequately supported by local advertising revenues, with little fear of fractionating the existing audience.

As to Subscription Television, this is essentially the broadcast version of premium or pay-cable services. The programming is not always advertiser-supported, and the viewer pays a monthly subscription for nominally high quality programs. The type of programming may be similar to that offered by HBO and other pay-cable systems. In fact, over-the-air subscription television would be in direct competition with pay-cable, and, based on the provisions of the 1992 Cable Competitiveness and Consumer Protection Act, "multi program supplier" stations could acquire many of the same cable program services.

However, the broadcaster seeking to introduce pay-television must adjust to a new market concept; make heavy investments in equipment, personnel, and customer services; and compete in a well established cable market.

The pay-television market is alive, well, and living in 43 percent of all basic cable homes.

In addition to the cost of program acquisition, additional capital and operating costs must be assessed. Subscription TV requires a set-top box with a conditional access system, and a descryptor in the home with customer access activated by the program supplier.

In the broadcaster case, customer access would be activated by the broadcaster.

It is instructive to look at some of these costs, based upon a major metropolitan market, such as Washington, D.C., which has 350,000 basic cable subscribers and 170,000 pay-cable subscribers.

As shown in Figure 1, the principal cost is the digital set top box, which today costs up to \$250 each. Installation and maintenance trucks will be required, and for pay-cable it is known that one truck is required for each 2000 subscribers. To be conservative, assume that one truck could service 2,500 broadcast subscribers. At this rate, the annual labor costs including the truck drivers, customer service and billing operators, together with overall system management costs a total \$2.8 million per year for 97 employees.

The pay-cable industry has established that 10 percent of the installed base of set-top boxes is damaged, and must be replaced each year. The depreciation of set-top boxes over five years, and debt service are the main other contributors to the annual operating expense total of \$17.6 million. To be competitive with pay-cable, the pay-television revenues of \$24.5 million are based on a monthly subscription rate of \$12.

The modest operating profit of \$4 million takes no account of program acquisition costs, nor of the incremental costs of operating a multi-program stream broadcast system, where some additional staff and technical equipment will be required for the recording and playback of the new program streams.

In a multi station market, it is unlikely that each station could market its own set-top box since only one "broadcaster" box would be acceptable to each subscriber. If the several stations in a market shared the costs of the set-top boxes, the installation and maintenance trucks, customer service, and billing operations, the situation wouldn't change significantly since they would also have to share the revenues from the \$12 monthly subscription fees.

If advertiser support is added, it could increase pay-TV revenues, but, as already discussed, it will likely erode the advertising revenue of the station's main channel.

In any case, such a co-op arrangement in a three station market could generate only 9 to 12 pay-TV channels assuming that one of the four or five channels available to each station would carry the station's regular "free" program service. Meanwhile, competitive cable operators can offer as many pay-TV channels as the market will support in addition to pay-per-view services.

As Ted Turner notes in the title of his recent book, "It ain't as easy as it looks".

While it may be a trivial case, un-supported program services can always be acquired without cost for broadcast on the additional channels. These may be information services, infommercials, sports data, or news services, often meeting the needs of niche markets. These are likely to have national or regional advertising integrated in the program, and some modest revenue may be gained from the program supplier in return for widening his audience.

It is also possible that the entire broadcast schedule of an independent station located in a neighboring market may be carried to mutual advantage. However, such programming is again likely to fractionate the audience for the station's primary broadcast channel while generating little or no incremental revenue.

The transmission of data and audio/video services to closed user groups has its own set of problems. The delivery of data requires a higher immunity to errors than does digital "standard" TV or HDTV, and over-the-air delivery of private information requires an extremely secure encryption system. While revenues could be substantial, this is a very competitive market, becoming more so with every mile of fiber laid. Besides, such a new and different business for broadcasters, if exclusive of an HDTV schedule, could prompt the FCC to put the ATV channels up for auction to all suppliers of such data and private audio/video services.

Thus, while the concept of "flexibility" for broadcasters is not bad, the light at the end of the multi-program ATV tunnel may be the headlight of the oncoming train.

Finally, while it is technically feasible to simply simulcast a station's normal NTSC programming in digital form on the ATV channel, it is most unlikely that such a service would ever justify the assignment of the digital ATV channels to existing broadcasters.

The inescapable facts are: first, that broadcasters must transition to digital broadcasting to survive in an all-digital world and to implement any of the new broadcasting services. Second, that the new simulcast channels are the only way to make this transition, and third, a significant portion of the daily ATV broadcast schedule will probably have to be wide screen HDTV to assure the exclusive assignment of these new ATV channels to the existing terrestrial broadcasters!

How will HDTV start?

As in the transition to color, the transition to wide screen HDTV will probably start with prime time programs. Up to 70 percent of these prime time programs are already produced in high definition, on 35mm film, and prime time programs are those with production budgets able to support ongoing HDTV production. Thus, at the outset, programmers and television networks are most likely to offer HDTV programs only in prime time, and prime time could be the most profitable day part for a station's multi-program services.

Unhappily, with today's technology these two services cannot be transmitted concurrently on a single channel. It will be either/or for some time to come.

What about the audience? Do the viewers want HDTV? Nobody really knows! While industry pundits pontificate on this question, there have been no HDTV audience tests, properly structured to yield statistically accurate results. One thing is clear. The young viewing population is a technically sophisticated and literate audience. Their interest in the wide screen, HDTV picture with multi-channel digital sound might well mirror their interest in, and commitment to, the CD digital audio that killed the phonograph record.

In any case, digital broadcasting and HDTV are on the near technical horizon. It is time for broadcasters to give serious thought as to how they will transition their stations to digital TV, and how they will accommodate a wide screen HDTV schedule, with or without other digital TV and/or data services. The return on the increased costs may be the survival of the business itself!

At a similar time, when radio was the Nation's prime entertainment and information medium, General Sarnoff, then President of the RCA, in closing his briefing to the NBC affiliates on the emergence of television at their annual convention in Atlantic City on September 13, 1947, said:

"Therefore, may I leave you with this final thought: I am not here to urge you to enter the field of television beyond the point where you yourselves think it is good business for you to do so, or to propose that you plunge all at one time. Rather, I would suggest that you reflect carefully and thoughtfully upon the possible ultimate effects of television upon your established business if you do nothing, and of the great opportunities for your present and future business if you do the right thing!"

Today, the flowering of digital technology opens a wealth of opportunity. Beware of a poverty of vision!

SUBSCRIPTION BROADCAST TV SERVICE

FOR 170,000 SUBSCRIBERS

CAPITAL COST		\$ MILLIONS	
BILLING SYSTEM		0.1	
SOFTWARE		0.05	
70 INSTALLATION TRUCKS		1.4	
170,000 SET TOP BOXES @ \$250.		<u>42.0</u>	
			43.55
ANNUAL OPERATING COSTS			
LABOR			
68 DRIVERS		2.1	
3 INSTALLATION MANAGEMENT		0.12	
15 CUSTOMER SERVICE OPERATORS		0.3	
8 BILLING OPERATORS		0.16	
3 OVERALL SYSTEM MANGEMENT		<u>0.15</u>	
			2.83
EXPENSE:			
TRUCK MAINTENANCE/ FUEL		0.21	
10% SET TOP REPLACEMENT		4.2	
TRUCK DEPRECIATION		0.28	
SET TOP DEPRECIATION		8.4	
INSURANCE		0.1	
DEBT SERVICE		4.4	
RENT		<u> </u>	
			17.59
OPERATING COST/ YEAR	\$20.42M		
REVENUE \$12/ SUBSCRIBER/ MONTH	\$24.48M		

FIGURE 1